



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: :
: :
Baldwin *et al.* : Art Unit: 2671
: :
Serial No. 09/280,250 : Examiner: Mano Padmanabhan
: :
Filed: 03/29/1999 : Atty's Docket: TD-147
For: Read Monitor Unit

APPEAL BRIEF

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APR 24 2003

Honorable Commissioner of Patents and Trademarks
Washington, DC 20231 Technology Center 2600

Sir:

Applicants herewith respectfully submit that the Examiner Padmanabhan's decision of 5/21/2002, finally rejecting Claims 1-40 in the present application, should be reversed, in view of the following arguments and authorities.

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| 01 FC:1402 | 320.00 OP |
| 02 FC:1253 | 930.00 OP |
| 03 FC:1403 | 280.00 OP |

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TABLE OF AUTHORITIES

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Real Party in Interest

The real party in interest, and assignee of this case, is 3Dlabs Inc., Ltd., which is now a subsidiary of Creative Technologies, of Singapore.

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Related Appeals or Interferences

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To the best knowledge and belief of the undersigned attorney, there are none. However, please note that 09/133,741 is another case of common assignee which is currently on appeal, and which involves the same general field of technology.

Status of Claims

Claims 1-40 are under final rejection, and are each appealed.

Status of Amendments after Final

Proposed Amendment submitted herewith: not yet entered.

SUMMARY OF INVENTION

The following summary refers to disclosed embodiments and their advantages, but does not delimit any of the claimed inventions.

Problem

In graphics systems, a read-modify-write operation is relied on when rendering primitives (e.g. triangles). Information regarding primitives is read from specific memory locations. If the information is modified, it must be written back in order for any new values to be used in later processing. In a heavily pipelined system, the individual functions of this read-modify-write operation can be widely separated in time. A situation can occur in which a second read on a memory

location is needed while outstanding data from a first read of the same location has been modified but has not yet been written back. If this situation is not properly handled, the second read will return the same data as the first read. In graphics, this is guaranteed not to occur within a primitive as the rasterization rules forbid it, but it can happen between primitives.

Currently, the solution to this second read problem is to force all outstanding writes to complete before any reads for the new primitive begin. Implementation of this solution is generally through a message such as *SuspendReads* (or such as a *PrepareToRender* message as in earlier generation pipelined graphics processors).

The desire to increase the small primitive rate by reducing the number of set up cycles has exposed the suspend/resume feedback path as a bottleneck which must be overcome to increase the small primitive rate.

Overview of Solution

The present application describes a new approach to the read-modify-write problems which occur in computer graphics: reading of pixel information during the rendering of a primitive is suspended if the pixel information has been touched by a previous write.

Several disclosed classes of embodiments also have more specific teachings:

In some embodiments, reads of pixel information are also suspended periodically when a table tracking the information becomes full.

In some embodiments a Read Monitor Unit controlled by the graphics system's Memory Controller is used to track pixels which have been affected by rendered primitives.

In some embodiments, a history list is used to avoid suspension of

reads for overlapping primitives. In a particular embodiment, the table used to track affected pixels is two bits, the first bit tracking whether the pixel has been touched by a primitive since the last *SuspendReads* command was invoked and the second bit tracking whether the pixel has been touched by the current primitive.

In a separate embodiment, a unique number is assigned to each primitive to be rendered. The number is recorded for each active pixel touched by the primitive. If an earlier primitive has touched this pixel, suspension of reads can be invoked and the table reset (i.e., every entry is marked invalid).

Advantages include:

- savings in processing time by preventing unnecessary suspension of reads;
- increased throughput in primitive rendering; and/or
- cost savings due to less stringent processing requirements.

Sample Hardware Implementation

Figure 1 is an overview of a graphics rendering subsystem which can utilize the disclosed embodiments of the read-modify-write solution. The overall architecture of the graphics core is best understood using the software paradigm of a message passing system. In this system, all the processing units are connected in a long pipeline, with communication with the adjacent units being done through message passing.

Detailed Operation

Figure 4 depicts a flow chart of the presently preferred embodiment. In the presently preferred embodiment, a Read Monitor Unit 108 is incorporated to track primitives and the pixels they affect as they are prepared for rendering. A unique number is assigned to each primitive before it is rendered (**Step 402**). The number is recorded in a table for each active pixel the rendering of the primitive will affect. (**Step 404**).

Before the table is updated for a pixel (initiated by an active step during rendering), the table is tested to see if any previously rendered primitives have been assigned to the pixel position (that is, the rendering of the previous primitive affected the pixel) (**Step 406**). If the pixel location has been previously touched, a *SuspendReads* command is invoked and sent down the pipeline (**Step 408**). When the *SuspendReads* command is invoked, every entry in the Read Monitor Unit 108 table is reset (marked invalid) (**Step 410**). The Read Unit 102 receives and writes the message to its address FIFO (**Step 412**). The message is also forwarded down the pipeline. The Read Unit 102 continues to generate messages to the address FIFO. However, the Memory Controller 106 will not issue reads on these addresses. Once the Write Unit 104 receives the *SuspendReads* message, it inserts the message into its queue (as a *ResumeReads* message for the Memory Controller 106) (**Step 414**). The message is also forwarded down the pipeline. Write requests are processed by the Memory Controller 106 until the *ResumeReads* message is reached (**Step 416**). Once the Controller 106 knows that the last writes have completed (or are unconditionally committed) and the table in the Read Monitor Unit 108 is reset, the *ResumeReads* message is acted upon and the read portion of the Memory Controller 106 is released to allow further reads (**Step 420**). In this scenario, it is possible that

a *SuspendReads* transaction need not be invoked. This situation occurs if the *SuspendReads* transaction would be redundant due to a previously affected pixel being touched far enough back in time for the memory location which holds its information to have been updated.

Use of "History List"

The above scheme handles macro level read-modify-write synchronization issues. However, antialiased primitives are virtually guaranteed to share pixels with their neighbors. This situation can result in a *SuspendRead* for each primitive. The most important antialiased primitive is lines. With a *SuspendReads* cost in the framebuffer of 42 cycles, the effective antialiased line rate is 2.9M. To improve the antialiased line performance, a mechanism to handle the micro level read-modify-write synchronization is needed.

In the presently preferred embodiment, the write pixel data for the recently processed pixels is held in a history list. The history list exists within the units which can modify read pixel data, for example, the Stencil Depth Unit 112 and the Alpha Blend Unit 110. Within these units, when an active step is received, the history list is checked to see if it holds a copy of the data written to this pixel. If it does, then the data in the history list is used instead of the read data accompanying the active step. Use of this technique anticipates that the read data is stale because the last data calculated for the recently calculated pixels, *i.e.*, what is in the history list, may not have had enough time to work its way through the pipelines into memory.

The Read Monitor Unit 108 also tracks recent pixels in a history list and when it finds a match it avoids sending out a *SuspendRead*.

If the history list is made large enough to hold all pixels which

can be pipelined between the read unit and the write unit, about 128 pixels, then the *SuspendReads* mechanism would be rendered redundant. In the presently preferred embodiment, a history list length of 8 pixels is used.

Embodiment Without Periodic Clear

This embodiment functions similarly to the presently preferred embodiment described above except as hereinafter described. In this embodiment a table which is two bits wide is used by the Read Monitor Unit 108 to track pixels which have been touched by a rendered primitive (or "dirty" pixels). The first bit of each table row is called the **dirty bit** and the second bit of each table row is referred to as the *primTouched bit*. The xy coordinate of each pixel is used to index the table. The table is kept to a manageable size by indexing the pixels with a hash function. A hash function allows the mapping of the entire pixel range into a number range small enough to remain manageable. In the presently preferred embodiment, the lower 5 bits of the x and y values of a pixel are concatenated together to yield a 10 bit index to the table. Alternatively, the XOR of the x and y values can be used.

The dirty bit for each pixel tracks whether that pixel has been affected by a primitive since the last *SuspendReads* command was invoked. The *primTouched* bit for each pixel tracks whether the pixel has been touched by the current primitive.

At the start of rendering (or whenever a *SuspendReads* command is invoked) all the entries in the table for all pixels are reset. At the start of rendering for each primitive, each *primTouched* bit for each pixel in the table is reset. For each pixel affected by a primitive, its corresponding dirty bit in the table is checked. If the bit has been set, a *SuspendReads* command is issued and the table is

reset. Once the table is reset, processing of the current primitive is resumed. If the dirty bit of a particular pixel which will be affected by rendering the primitive is clear, then it is safe to issue a read of the pixel information. The *primTouched* bit of the pixel's row is set to record the fact that the pixel has been read (touched).

Once the primitive has been rendered, all the *primTouched* bits for the affected pixels are stored into their corresponding dirty bit entries. This transfer maintains an accumulated record of affected pixels. This embodiment offers the advantage of avoiding an automatic *SuspendReads* and clearing of the table every 32 primitives.

ISSUES

- 1. Are Claims 1-5, 7-10, and 33-40 obvious over Huxley?**
- 2. Are Claims 6 and 11 obvious over Huxley and Wang *et al.*?**
- 3. Are Claims 12-28 obvious over Huxley and Wang *et al.*?**
- 4. Are Claims 29-32 obvious over Huxley, Wang *et al.*, and Jenkins?**

Grouping of Claims

The claims on appeal do not stand or fall together, as may be seen from the arguments set forth below. Each claim should be considered separately.

ARGUMENT

Stated Grounds of Rejection

The rejections outstanding against the Claims are as follows:

1. Claims 1-5, 7-10, and 33-40 have been rejected under §103, as obvious over Huxley '796. See item 5 in the 05/21/2002 Office Action.
2. Claims 6 and 11 have been rejected under §103, as obvious over Huxley '796 in view of Wang *et al.* '640. See item 6 in the 05/21/2002 Office Action.
3. Claims 12-28 have been rejected under §103, as obvious over Huxley '796 in view of Wang *et al.* '640. See item 7 in the 05/21/2002 Office Action.
4. Claims 29-32 have been rejected under §103, as obvious over Huxley '796 in view of Wang *et al.* '640 and Jenkins '582. See item 8 in the 05/21/2002 Office Action.

Rejections under §103

Legal Standards

Any obviousness rejection requires some showing of motivation to modify or combine the reference(s) applied, in a way which meets the claimed invention. In the long line of case law stemming from *Graham v. John Deere*,¹ many Federal Circuit opinions have summarized this legal requirement; one frequently-cited recent case is *In re Rouffet*.² This opinion states very emphatically (with many citations):³

[T]he examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination **in the manner claimed**.⁴

[E]ven when the level of skill in the art is high, the

¹*Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966).

²149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998).

³Cases cited to support the Court's emphasis on motivation include: *In re Geiger*, 815 F.2d 686, 2 USPQ2d 1276 (Fed. Cir. 1987); *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 37 USPQ2d 1626 (Fed. Cir. 1996); *In re Sernaker*, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 227 USPQ 657 (Fed. Cir. 1985); *In re Beattie*, 974 F.2d 1309, 24 USPQ2d 1040 (Fed. Cir. 1992); *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984); *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 218 USPQ 865 (Fed. Cir. 1983); *Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 219 USPQ 8 (Fed. Cir. 1983); and *Sensonics, Inc. v. Aerosonic Corp.*, 81 F.3d 1566, 38 USPQ2d 1551 (Fed. Cir. 1996).

⁴*In re Rouffet*, 149 F.3d at 1357 (emphasis added).

Board must identify **specifically** the principle, known to one of ordinary skill, that suggests the **claimed** combination. Cf. *Gechter v. Davidson*, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997) (explaining that the Board's opinion must describe the basis for its decision). In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the **claimed** invention obvious.⁵

Even more recently the CAFC, in *In re Lee*⁶, after citing *In re Dance*⁷ for the proposition that "there must be some motivation, suggestion, or teaching of the desirability of making the **specific** combination that was made by the applicant,"⁸ emphasized that: "The need for specificity pervades this authority. See, e.g., *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) ("particular findings must be made as to the reason the skilled artisan,

⁵*In re Rouffet*, 149 F.3d at 1359 (emphasis added).

⁶277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002), cited and applied, e.g., by *In re Huston*, 308 F.3d 1267, 64 USPQ2d 1801 (Fed. Cir. 2002). Note that Huston upheld a rejection, but explicitly applied *Lee*'s standard.

⁷160 F.3d 1339, 48 USPQ2d 1635 (Fed. Cir. 1998). The Court's opinion also cites *Rouffet* and many other cases in the same vein, including *In re Grasselli*, 713 F.2d 731, 218 USPQ 769, (Fed. Cir. 1983); *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 60 USPQ2d 1001 (Fed. Cir. 2001); *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 56 USPQ2d 1456 (Fed. Cir. 2000); *C.R. Bard, Inc. v. M3 Systems, Inc.*, 157 F.3d 1340, 48 USPQ2d 1225 (Fed. Cir. 1998)); *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999) *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 221 USPQ 929 (Fed. Cir. 1984); and *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992).

⁸*Id.* at 1343 (emphasis added).

with no knowledge of the claimed invention, would have selected these components for combination **in the manner claimed**"⁹). . . ."

A similarly emphatic discussion is found in *Ruiz v. A.B. Chance Co.*, where the Court, after a long review of the case law, concludes that the showing of combinability must be "**clear and particular**."¹⁰

In *Thrift*¹¹ a rejection which "does not discuss the unique limitations" of the claims was held to be "simply inadequate on its face." In this case a rejection was held "not supported by substantial evidence because **the cited references do not support each limitation** of [the claim in question]. See *In re Vaeck*, 947 F.2d 488, 493, 20 USPQ2d 1438, 1443 (Fed. Cir. 1991)."¹²

The Board too has held to this standard; see e.g. *Ex parte Levengood*, 28 USPQ2d 1300, 1304-05 (B.P.A.I. 1993), *Ex parte Obukowicz*, 27 USPQ2d 1063, 1065 (B.P.A.I. 1992), and *Ex parte Clapp*, 227 USPQ 972, 973 (B.P.A.I. 1985).

Even the Manual of Patent Examining Procedure, citing many of these cases, uses an entire subsection (MPEP §§2143.03) to emphasize that an alleged motivation must meet ALL LIMITATIONS of the claimed invention.¹³

⁹*In re Lee*, 277 F.3d at 1343 (emphasis added).

¹⁰234 F.3d 654, 57 USPQ2d 1161 (Fed.Cir. 2000), citing *In re Dembiczak*, 175 F.3d at 999 (emphasis added here by Applicant).

¹¹*In re Thrift*, 298 F.3d 1357 (Fed.Cir. 2002).

¹²*In re Thrift*, 298 F.3d at 1366 (emphasis added).

¹³Copies of MPEP §§2143-2143.03 (pages 124-129 of the first Revision of the 8th Edition), are attached as Appendix B. Of course the MPEP is not authority which binds the Board; these pages are provided merely as a convenient and well-written summary of relevant points of case law.

Review of the References

Some of the major technical differences between the references applied and the disclosure of the present application will now be reviewed. Of course, these points in the specification do not define the scope or interpretation of any of the claims; they are listed merely to help appreciate the importance of the claim distinctions which will be reviewed thereafter.

Huxley '795

Huxley is the main reference, and shows an example of the pipelined graphics architecture to which the present application provides an improvement. The Board will note that neither of the two embodiments of Huxley's Figures 2A and 2B show anything corresponding to the Read Monitor Unit 108 which is shown in Figure 1 of the present application. (Huxley's Figure 2B shows the router connected directly to the local buffer read module, and Figure 2A shows the output of the scissor/stipple block connected through three intervening units, none of which correspond to the Read Monitor Unit of Figure 1.)

The outstanding Office Action admits that "Huxley does not explicitly teach suspending of reads of pixel data during rendering of primitives only selectively...."¹⁴ Examiner Padmanabhan goes on to paraphrase what Huxley does teach, but note that the words "only selectively" are admittedly not met.

A key point in Huxley seems to be in Column 58, where the patent states that:

4. ... Each read address is qualified by a Suspend Reads flag, which is normally reset. A PrepareToRender

¹⁴Page 4 II.4-5.

message will cause a write to the Ra FIFO with this flag set and an undefined address. On detecting this flag set the Framebuffer Interface Unit will not start **this read, or any subsequent ones** received until it detects the Resume Reads signal being set. The Resume Reads signal is issued by the Framebuffer Write Unit once all the writes for the old primitive have been issued and only allows the reads to resume once all the writes have been completed. It is the PrepareToRender message which activates these flags.¹⁵

That is, the *PrepareToRender* message shuts down ALL reads until a *ResumeReads* signal comes through, and that does not happen until ALL outstanding writes have been completed. Huxley's approach is the same as that discussed and criticized in the Background section of the present application:

Currently, the solution to this second read problem is to force all outstanding writes to complete before any reads for the new primitive begin. Implementation of this solution is generally through a message such as *SuspendReads....*

The desire to increase the small primitive rate by reducing the number of set up cycles has exposed the suspend/resume feedback path as a bottleneck which must be overcome to increase the small primitive rate.

¹⁵Col.58 (emphasis added).

Examiner Padmanabhan has also admitted that Huxley "fails to teach use of a table to track each touched pixel."¹⁶

Wang *et al.* '640

Wang *et al.* relates to texture fetches, but does not appear to show any relevance to the particular problems of read-modify-write addressed in the present application. It is quite correct, as the Examiner says, that Wang teaches a cache controller, but Wang does not make any suggestion whatever of suspending reads only selectively, nor of keeping track of which pixels have been touched by rendered primitives.

The Office Action cited only the Abstract of Wang, and Wang is not seen to offer any teaching more useful than the presence of a cache controller.

Jenkins '582

Jenkins does appear to fall within the general area of computer graphics, but primarily relates to high-level image generation issues. Jenkins does not appear to show any relevance to the particular problems of read-modify-write coherency addressed in the present application. The Examiner cites column 77 of Jenkins for assigning unique identifiers to primitives for keeping track of which primitives are visible, but of course this has nothing whatever to do with the problems of read-modify-write collisions which are addressed by the present application.

¹⁶Page 8 ll.14-15.

Claims 1, 7, and 37

It seems to be agreed that Huxley does not teach suspending of reads during rendering of primitives only selectively. The question is then whether the art shows a motivation WHY a routineer should modify Huxley to meet this limitation. Examiner Padmanabhan has suggested that the motivation would be "so that the integrity of the data and the display are not compromised." However, this objective would also be achieved by Huxley, and there is no suggestion in the references relied on that Huxley is defective in this respect. Thus the suggested motivation would not lead one of ordinary skill to make ANY change to Huxley, much less the specific claimed relations.

Indeed Examiner Padmanabhan has now agreed that Huxley is not defective in data integrity.¹⁷ This destroys the alleged motivation for modifying Huxley.

Moreover, the suggested motivation would not lead to the suggested modification. Without such motivation, the rejections of **Claims 1, 7, and 37** amount merely to impermissible hindsight reconstruction.

The outstanding rejection also asserts that "It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a table of pixels with respective bits set to track all pixels whose information has not yet been updated or discarded, and pixels which will be affected by the primitive to be rendered, since access to data in a table would have been more efficient than setting a flag."¹⁸ This assertion is totally unsupported by evidence, and is strongly disputed. The references do not remotely

¹⁷OA p.13 last line – p.14 l.1.

¹⁸5/21/02 OA, p.5, bottom.

suggest "bits set to track all pixels whose information has not yet been updated or discarded, and pixels which will be affected by the primitive to be rendered." (Thus the elements of the asserted combination are not present in the art.) This extremely aggressive assertion goes far beyond even the asserted interpretation of Huxley which is disputed above.

Also, substitution of a table for flag bits may not be more efficient, and this assertion too is disputed.

Many claims would be invalidated if the word "ONLY" could only be removed from them! However, the Examiner has not shown any reason why this word can be disregarded in Claims 1 and 7 of the present application, nor any combination of references which can meet all limitations of these claims without removing the word "only."

The words "only selectively" also appear in the different contexts of Claims 7 and 37, and the rejection of those independent claims is similarly defective.

Claim Interpretation

Since the Examiner has agreed that Huxley does not explicitly teach the limitation "only selectively," and has not made any showing that Huxley teaches this limitation implicitly, one may wonder whether there is a lurking issue of claim interpretation. Applicant would note that the limitation "only selectively" should be construed in accordance with the specification, i.e. to exclude the conventional process of stalling all reads when a read-write collision occurs. For example, the Summary section states that reading of pixel information during the rendering of a primitive is suspended if the pixel information has been touched by a previous write.

Dependent claims are also relevant to interpretation, and the broad phrase "only selectively" is implicitly defined by numerous

dependent claims. For example, FOUR dependent claims affect the interpretation of this phrase in Claim 1, and help to clarify that the phrase "only selectively" does not apply to the non-selective stall used in Huxley. Other independent claims are accompanied by similarly helpful entourages of dependent claims.

Many of the Examiner's asserted combinations do not come any closer to meeting the limitation "only selectively" than does Huxley alone. In light of the above admission, the asserted combinations would seem to refuted by the Examiner's own admission.

However, to avoid dispute on correct claim interpretation, Applicant also is submitted a Proposed Amendment to ensure that the claims which use this phrase are interpreted in accordance with the application as filed.

All Limitations Must Be Addressed

Even in claims which have been rejected over the combination of Wang with Huxley, the general teaching regarding caching in Wang does not remotely suggest the specific claimed relations. Many of these claimed relations have not been addressed by the Examiner.

Claim 33

For example, it is not true, as Examiner Padmanabhan has suggested, that Claims 33-36 are merely "claims to systems that implement the method of claims 1, 3, 5, and 6...." Claim 33 (unlike Claim 1) recites the combination of "a read unit", a "write unit", and a "read monitor unit to prevent primitive information which has been modified from being read by said read unit before said write unit has updated said information." There is no "read monitor unit" recited in Claim

1, nor does Claim 1 recite any step of preventing modified information "from being read by said read unit before said write unit has updated said information."

This claim shows a general problem with most of the outstanding rejections: **the stated motivations do not reach the claimed inventions.** There are many claimed inventions in this large application, and many specific claim limitations have not been met by the asserted motivation.

Applicant also notes that many of the outstanding rejections did not address the exact language of the claims, but rather a suggested paraphrase. This is improper.

Claim 12

Claim 12 recites a combination of three actions, which are not shown by Huxley. Examiner Padmanabhan acknowledges that Huxley "fails to teach use of a table to track each touched pixel." Examiner Padmanabhan goes on to suggest a combination in which Huxley would be modified to "not suspend reads until a write is required to avoid stale data, and then issue suspend read to process **all** pending writes...."¹⁹ This clearly shows that the asserted combination would NOT mean the claim limitation of "only selectively".

In the same sentence, Examiner Padmanabhan suggests that the motivation for this combination would be that "this will increase process efficiency." This statement appears to be untrue, since adding a useless table reset operation to Huxley would actually **DECREASE** efficiency.

This asserted motivation is also insufficient to motivate one of

¹⁹OA p.9 l.2.

ordinary skill in the art. Of course increased processing efficiency is desirable, but that is a general goal which would not nearly account for the suggested changes (even if they made engineering sense). Motivation must be motivation which makes sense to one of ordinary skill, not mere sweeping statements.

Claim 16

The Office Action states that "As per the step of copying the second bit into the first bit after each primitive is rendered, Wang teaches better cache/memory management by processing multiple requests simultaneously."²⁰ However, the two halves of this sentence do not appear to have anything to do with each other. It is quite true that Wang shows a cache controller, but that does not in any way imply anything about the claimed specific relation between bits.

The suggested motivation for the Examiner's proposed reconstruction of Claim 16 is mere "to optimize system efficiency." However, this too is a general statement of purpose, not any sort of motivation for the suggested combination. In engineering discussions, such general statements do not carry weight by themselves: anyone who made such an argument would be asked "WHY do you think this change would optimize system efficiency?" That is, a general allegation of improved efficiency would not be sufficiently specific to provide motivation to one of ordinary skill.

²⁰This quote begins on the last two lines of p.9.

Claim 21

Examiner Padmanabhan has suggested that Claim 21 is "similar" to Claim 12 "with the exception of tracking the pixel in a record here versus a table in Claim 12."²¹ This is inaccurate, and omits much of the wording of both claims.

Applicants have paid to have each of their claims examined, and have made great efforts to present claim language which is not identical. However, Examiner Padmanabhan's cursory dismissal of Claim 21 has not even addressed the specific limitations of this claim.

Specifically, Claim 21 discusses not only "keeping a record of each pixel touched", but also conditionally "removing a pixel from said record if said pixel information is updated or discarded...." The Wang reference is even less relevant to Claim 21 than to Claim 12.

Claim 25

Examiner Padmanabhan has also stated that the limitations of Claim 25 "are a subset of Claim 12...." This is **NOT TRUE**. Claim 25 expressly recites "suspending reads of pixel information ... only if the primitive to be rendered will affect pixel information that has been previously rendered and has not had sufficient time to update." The language "has not had sufficient time to update" does not appear in Claim 12. Thus the neglect of Claim 25's language shows that this claim has not even received a complete examination, and certainly has not received a proper prima facie obviousness rejection.²²

²¹OA p.10 ll.8-9.

²²Of course, any rejection stated against Claim 25 henceforth should properly be made in a new nonfinal Action.

Claim 29

The rejection of Claim 29 is yet another which does NOT address the words of the claim. Claim 29 recites, among other limitations, "if a primitive to be rendered will affect pixel information that has been affected by a previously rendered primitive, suspending reading of primitive information unless said affected pixel information has been updated." The logical relationship of "suspending reading... unless {condition}" is not remotely suggested by the references of record, and the Examiner has not suggested any rationale for rejecting this limitation.

The second paragraph of Claim 29²³ was examined and rejected, on the grounds that "It would have been obvious ... to assign unique IDs to primitives in Huxley, and track affected pixels using this unique ID, since these IDs can be efficiently used to do a lookup into the table of affected pixels for faster processing."²⁴ However, the underlined clause does not appear as a teaching anywhere in the prior art. This asserted motivation seems to be an usually pure example of hindsight reconstruction.

Indeed, while the use of unique identifiers for primitives is not claimed to be new, the use of unique primitive identifiers AS A WAY OF SOLVING READ-MODIFY-WRITE COLLISIONS is not suggested anywhere in the references of record.

²³This paragraph recites "tracking the pixels affected by each rendered primitive using said unique identifier".

²⁴OA page 11, third line from bottom (emphasis added).

Claim 7

It is not true, as Examiner Padmanabhan has asserted, that Claim 7 is merely "a combination of claims 1 and 2." Admittedly much of the wording of Claims 2 and 7 is similar, but the limitations are differently ordered and differently stated, and the relations of the elements are recited differently. (Claim 7, unlike Claims 1 and 2, expressly recites "allocating individual rendering operations to respective ones of said processing units....")

Other Specific Nonobvious Limitations

Thus, none of the references, singly or in combination, are seen to teach or suggest the claimed features of: "invoking suspension of reads of pixel information during rendering of primitives only selectively" as recited, with other limitations, in the context of Claim 1 and its dependent claims.

None of the references, singly or in combination, are seen to teach or suggest that "a table of pixel information is used to determine if reads should be suspended" as recited, with other limitations, in the context of Claim 3.

Thus, none of the references, singly or in combination, are seen to teach or suggest "invoking suspension of reads ... only selectively" ... "if a primitive being rendered will affect a pixel location which has been previously touched by the rendering of a primitive and has not yet been updated" as recited, with other limitations, in the context of Claim 4.

Thus, none of the references, singly or in combination, are seen to teach or suggest "invoking suspension of reads ... only selectively" using "a table of pixel information to determine if reads should be suspended, said table comprising a first bit and a second bit and wherein said

first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered" as recited, with other limitations, in the context of Claim 5.

None of the references, singly or in combination, are seen to teach or suggest "invoking suspension of reads ... only selectively", "wherein said invoking step is not performed if a primitive to be rendered appears in a history list of recently rendered primitive data" as recited, with other limitations, in the context of Claim 6.

Thus, none of the references, singly or in combination, are seen to teach or suggest the claimed features of: "invoking suspension of reads of pixel information during rendering of primitives only selectively" as recited, with other limitations, in the context of Claim 7 and its dependent claims.

None of the references, singly or in combination, are seen to teach or suggest that "a table of pixel information is used to determine if reads should be suspended" as recited, with other limitations, in the context of Claim 8.

None of the references, singly or in combination, are seen to teach or suggest "invoking suspension of reads ... only selectively" ... "if a primitive being rendered will affect a pixel location which has been previously touched by the rendering of a primitive and has not yet been updated" as recited, with other limitations, in the context of Claim 9.

None of the references, singly or in combination, are seen to teach or suggest "invoking suspension of reads ... only selectively" using "a table of pixel information to determine if reads should be suspended, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet

been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered" as recited, with other limitations, in the context of Claim 10.

None of the references, singly or in combination, are seen to teach or suggest "invoking suspension of reads ... only selectively", "wherein said invoking step is not performed if a primitive to be rendered appears in a history list of recently rendered primitive data" as recited, with other limitations, in the context of Claim 11.

None of the references, singly or in combination, are seen to teach or suggest the claimed features of: "setting a flag in said table corresponding to each touched pixel;" and "suspending reads of pixel information if a pixel that will be touched by a primitive to be rendered is flagged" as recited, with other limitations, in the context of Claim 12.

Even more clearly, none of the references, singly or in combination, are seen to teach or suggest the claimed features of: "setting a flag in said table corresponding to each touched pixel; suspending reads of pixel information if a pixel that will be touched by a primitive to be rendered is flagged; and clearing said flags and resuming reads after pixel information of said flagged pixels has been updated or discarded" as recited, with other limitations, in the context of Claim 12.

None of the references, singly or in combination, are seen to remotely suggest the claimed table which "comprises a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered" as recited, with other limitations, in the context of Claim 13.

None of the references, singly or in combination, are seen to teach or suggest the claimed features of: "suspending reads of pixel information if a pixel that will be touched by a primitive to be rendered is flagged", wherein the flags "are indexed according to the xy coordinates of said pixels" as recited, with other limitations, in the context of Claim 14.

None of the references, singly or in combination, are seen to teach or suggest the claimed features of: "suspending reads of pixel information if a pixel that will be touched by a primitive to be rendered is flagged; and clearing said flags and resuming reads after pixel information of said flagged pixels has been updated or discarded ... , wherein suspending and clearing steps are not performed if said primitive to be rendered appears in a history list of recently rendered primitive data" as recited, with other limitations, in the context of Claim 15.

None of the references, singly or in combination, are seen to teach or suggest the claimed features of: "copying said flagged second bit entries to said first bit entries after each primitive is rendered" as recited, with other limitations, in the context of Claim 16.

Even more clearly, none of the references, singly or in combination, are seen to teach or suggest the claimed features of: "copying said flagged second bit entries to said first bit entries after each primitive is rendered" and "suspending reads of pixel information if said first bit entry of a pixel that will be touched by a primitive to be rendered is flagged" as recited, with other limitations, in the context of Claim 16.

Still more clearly, none of the references, singly or in combination, are seen to teach or suggest the three claimed actions of: "copying said flagged second bit entries to said first

bit entries after each primitive is rendered; suspending reads of pixel information if said first bit entry of a pixel that will be touched by a primitive to be rendered is flagged; and clearing all flags and resuming reads after pixel information of all said flagged pixels has been updated or discarded" as recited, with other limitations, in the context of Claim 16.

None of the references, singly or in combination, are seen to teach or suggest the claimed "table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered" as recited, with other limitations, in the context of Claim 18.

None of the references, singly or in combination, are seen to teach or suggest the claimed feature that "flags corresponding to said pixels are indexed according to the xy coordinates of said pixels" as recited, with other limitations, in the context of Claim 19.

None of the references, singly or in combination, are seen to teach or suggest the claimed feature that the "suspending and clearing steps are not performed if said primitive to be rendered appears in a history list of recently rendered primitive data" as recited, with other limitations, in the context of Claim 20.

None of the references, singly or in combination, are seen to teach or suggest the claimed action of "removing a pixel from said record if said pixel information is updated or discarded" as recited, with other limitations, in the context of Claim 21.

A fortiori none of the references, singly or in combination, are seen to teach or suggest the claimed combination of "removing a pixel from said record if said pixel information is

updated or discarded; and suspending reads of pixel information if a primitive to be rendered will affect a pixel whose entry remains in said record" as recited, with other limitations, in the context of Claim 21.

None of the references, singly or in combination, are seen to teach or suggest the claimed feature of a "table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered" as recited, with other limitations, in the context of Claim 23.

None of the references, singly or in combination, are seen to teach or suggest the claimed feature that the "suspending step is not performed if said primitive to be rendered appears in a history list of recently rendered pixel data" as recited, with other limitations, in the context of Claim 24.

None of the references, singly or in combination, are seen to teach or suggest the claimed features of: "suspending reads.... only if the primitive to be rendered will affect pixel information that has been previously rendered and has not had sufficient time to update" as recited, with other limitations, in the context of Claim 25.

None of the references, singly or in combination, are seen to teach or suggest the claimed combination of a first bit which "flags all pixels whose information has not yet been updated or discarded" with a second bit which "flags pixels which will be affected by said primitive to be rendered" as recited, with other limitations, in the context of Claim 27.

None of the references, singly or in combination, are seen to teach or suggest a suspending step which "is not invoked if said primitive to be rendered appears in a history list of recently rendered primitive data" as recited, with other

limitations, in the context of Claim 28.

None of the references, singly or in combination, are seen to teach or suggest the claimed features of: "assigning a unique identifier to each primitive before it is rendered" and "tracking the pixels affected by each rendered primitive using said unique identifier" as recited, with other limitations, in the context of Claim 29.

More clearly yet, none of the references, singly or in combination, are seen to teach or suggest the claimed combination of: "assigning a unique identifier to each primitive before it is rendered; tracking the pixels affected by each rendered primitive using said unique identifier; and if a primitive to be rendered will affect pixel information that has been affected by a previously rendered primitive, suspending reading of primitive information unless said affected pixel information has been updated" as recited, with other limitations, in the context of Claim 29.

None of the references, singly or in combination, are seen to teach or suggest that "reads are not suspended if said primitive to be rendered appears in a history list of recently rendered primitive data" as recited, with other limitations, in the context of Claim 31.

None of the references, singly or in combination, are seen to teach or suggest a table which "is used to track said pixels with said unique identifier" and which includes a first bit which "flags all pixels whose information has not yet been updated or discarded" and a second bit which "flags pixels which will be affected by said primitive to be rendered" as recited in Claim 32.

None of the references, singly or in combination, are seen to teach or suggest a read monitor unit which can "prevent primitive information which has been modified from being read by

said read unit before said write unit has updated said information" as recited, with other limitations, in Claim 33.

Even more clearly, none of the references, singly or in combination, are seen to teach or suggest a read monitor unit which can "prevent primitive information which has been modified from being read by said read unit before said write unit has updated said information; wherein said read monitor unit tracks pixel information affected by previously rendered primitives and suspends reads if a primitive to be rendered will affect pixel information which has been affected by a previously rendered primitive until said pixel information has had time to update" as recited, with other limitations, in Claim 33.

None of the references, singly or in combination, are seen to teach or suggest the use of two bits recited in Claim 35.

None of the references, singly or in combination, are seen to teach or suggest the use of the history list recited in Claim 36.

None of the references, singly or in combination, are seen to teach or suggest that "suspension of reads of pixel information during rendering of primitives is invoked only selectively" as recited in Claim 37.

None of the references, singly or in combination, are seen to teach or suggest the use of two bits recited in Claim 39.

None of the references, singly or in combination, are seen to teach or suggest the use of the history list recited in Claim 40.

Grouping of Claims

The claims on appeal do not stand or fall together, since they contain distinct recitations which are relevant to patentability and to the specific rejections stated. For example:

Unlike other pending claims, Claims 1, 7, and 37 (and their dependent claims) contain the limitation "only selectively" which is argued above.

Unlike other pending claims, Claims 2 and 7 refer to "four functionally distinct processing units, allocated to individual rendering operations, connected in a pipeline relationship." As discussed in the Background and Summary sections of the present application, the disclosed innovations are particularly advantageous in this context (though not necessarily limited to it).

Unlike other pending claims, Claims 3, 5, 8, 10, 12, 16, 17, 18, 22, 23, 26, 27, 30, 32, 34, 35, 38, and 39 recite "a table" which is used to implement various recited functions.

Unlike other pending claims, Claim 4 recites that "reads are suspended if a primitive being rendered will affect a pixel location which has been previously touched by the rendering of a primitive and has not yet been updated." Claim 9 similarly recites that "if a primitive to be rendered will affect pixel information that has been affected by a previously rendered primitive, suspending reading of primitive information unless said affected pixel information has been updated." Many of the claims which recite a "first bit" and a "second bit" refer to updating, but Claims 4 and 9 are generally broader.

Unlike other pending claims, Claims 5, 10, 13, 16, 18, 23, 27, 32, 35, and 39 recite first and second bits with specified functions.

Unlike other pending claims, Claims 11, 15, 20, 24, 28, 31, 36, and 40 recite use of a "history list" to implement various recited functions.

Unlike other pending claims, Claim 12 recites the action of "clearing said flags and resuming reads after pixel information of said flagged pixels has been updated or discarded." (Claim 16 differs from Claim 12, among other ways, in reciting that ALL flags are cleared.)

Unlike other pending claims, Claims 14 and 19 recite indexing of flags "according to the xy coordinates" of said pixels.

Unlike any other pending claim, Claim 16 recites "copying said flagged second bit entries to said first bit entries after each primitive is rendered" (among other limitations).

Unlike any other pending claim, Claim 21 recites "removing a pixel from said record if said pixel information is updated or discarded...."

Unlike other pending claims, Claims 25 and 33 refer to sufficient "time to update".

Unlike any other pending claims, Claim 29 and its dependents recite "tracking the pixels affected by each rendered primitive using said unique identifier...."

Note that, while use of a unique identifier for primitives is known per se, use of a unique identifier to solve read-modify-write problems is not shown at all by the

references of record.

Unlike other pending claims, Claim 37 refers to "at least four functionally distinct processing units, each including hardware elements which are customized to perform a rendering operation which is not performed by at least some others of said processing units; at least some ones of said processing units being connected to operate asynchronously to one another." As discussed in the Background and Summary sections of the present application, the disclosed innovations are particularly advantageous in this context (though not necessarily limited to it).

Also unlike any other pending claims, Claim 37 and its dependents r e c i t e " a p i p e l i n e d multiple-instruction-multiple-device (MIMD) graphics processing architecture...."

Each claim should be considered separately; or at the very least each claim which is argued separately in the preceding sections of this brief should be considered separately. Argument: The fact that the claims use different formulations (as detailed above) and/or have been argued separately, shows that, if their patentability is not considered separately, any adverse decision would show that the limitations of some claims had been unfairly ignored.

REQUESTED RELIEF

The Board is respectfully requested to reverse the outstanding rejections.

Respectfully submitted,

A handwritten signature in black ink, appearing to be 'R. Groover', with a long horizontal flourish extending to the right.

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April 21, 2003

In re application of: :
 Baldwin *et al.* : Art Unit: 2671
 Serial No. 09/280,250 : Examiner: Mano Padmanabhan
 Filed: 03/29/1999 : Atty's Docket: TD-147
 For: Read Monitor Unit

1. A method for rendering 3D graphics, comprising the steps of:
rendering primitives which comprise a graphics display;
invoking suspension of reads of pixel information during rendering
of primitives only selectively; and
5. writing data generated by said rendering step into a frame buffer,
and outputting data from said frame buffer at video rates.
2. The method of Claim 1, wherein said rendering is performed in a
rendering system which includes at least four functionally distinct
processing units, allocated to individual rendering operations,
connected in a pipeline relationship.
3. The method of Claim 1, wherein a table of pixel information is
used to determine if reads should be suspended.

4. The method of Claim 1, wherein reads are suspended if a primitive being rendered will affect a pixel location which has been previously touched by the rendering of a primitive and has not yet been updated.
5. The method of Claim 1, wherein a table of pixel information to determine if reads should be suspended, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said
5 second bit flags pixels which will be affected by said primitive to be rendered.
6. The method of Claim 1, wherein said invoking step is not performed if a primitive to be rendered appears in a history list of recently rendered primitive data.
7. A method for rendering 3D graphics, comprising the steps of:
providing data to be rendered to a rendering system which includes at least four functionally distinct processing units connected in a pipeline relationship;
5 allocating individual rendering operations to respective ones of said processing units, and performing said rendering operations;
invoking suspension of reads of pixel information during rendering of primitives only selectively; and
writing data generated by said processing units into a frame buffer,
10 and outputting data from said frame buffer at video rates.

8. The method of Claim 7, wherein a table of pixel information is used to determine if reads should be suspended.
9. The method of Claim 7, wherein reads are suspended if a primitive being rendered will affect a pixel location which has been previously touched by the rendering of a primitive and has not yet been updated.
10. The method of Claim 7, wherein a table of pixel information to determine if reads should be suspended, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered.
11. The method of Claim 7, wherein said invoking step is not performed if a primitive to be rendered appears in a history list of recently rendered primitive data.

12. A method of computer graphics memory management, comprising the actions of:
- tracking each pixel touched by rendered primitives in a table by
setting a flag in said table corresponding to each touched pixel;
5 suspending reads of pixel information if a pixel that will be touched
by a primitive to be rendered is flagged; and
clearing said flags and resuming reads after pixel information of
said flagged pixels has been updated or discarded.
13. The method of Claim 12, wherein said table comprises a first bit
and a second bit and wherein said first bit flags all pixels whose
information has not yet been updated or discarded and said
second bit flags pixels which will be affected by said primitive
to be rendered.
14. The method of Claim 12, wherein said flags corresponding to said
pixels are indexed according to the xy coordinates of said pixels.
15. (AMENDED) The method of Claim 12, wherein suspending and
clearing steps are not performed if said primitive to be rendered
appears in a history list of recently rendered primitive data.

16. A method of computer graphics memory management, comprising the actions of:
- tracking each pixel touched by rendered primitives in a table comprised of a first bit entry and second bit entry for each pixel;
- 5 setting a flag in said second bit entry corresponding to each pixel which will be touched by a primitive to be rendered;
- copying said flagged second bit entries to said first bit entries after each primitive is rendered;
- 10 suspending reads of pixel information if said first bit entry of a pixel that will be touched by a primitive to be rendered is flagged; and
- clearing all flags and resuming reads after pixel information of all said flagged pixels has been updated or discarded.
17. The method of Claim 16, wherein a table is used to store said flags.
18. The method of Claim 16, wherein a table is used to store said flags, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered.
19. The method of Claim 16, wherein said flags corresponding to said pixels are indexed according to the xy coordinates of said pixels.

20. The method of Claim 16, wherein suspending and clearing steps are not performed if said primitive to be rendered appears in a history list of recently rendered primitive data.
21. A method of computer graphics memory management, comprising the actions of:
- keeping a record of each pixel affected by a rendered primitive;
removing a pixel from said record if said pixel information is
5 updated or discarded; and
suspending reads of pixel information if a primitive to be rendered will affect a pixel whose entry remains in said record.
22. The method of Claim 21, wherein said record is kept in a table.
23. The method of Claim 21, wherein said record is kept in a table, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered.
24. The method of Claim 21, wherein said suspending step is not performed if said primitive to be rendered appears in a history list of recently rendered pixel data.

25. A method of computer graphics memory management, comprising the actions of:
- tracking each primitive to be rendered and the pixel information each said primitive will affect; and
 - 5 suspending reads of pixel information between rendering of each said primitive only if the primitive to be rendered will affect pixel information that has been previously rendered and has not had sufficient time to update.
26. The method of Claim 25, wherein a table is used to track said primitives.
27. The method of Claim 25, wherein a table is used to track said primitives, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered.
28. The method of Claim 25, wherein said suspending step is not invoked if said primitive to be rendered appears in a history list of recently rendered primitive data.

29. A method of computer graphics memory management, comprising the actions of:
- assigning a unique identifier to each primitive before it is rendered;
- tracking the pixels affected by each rendered primitive using said
- 5 unique identifier; and
- if a primitive to be rendered will affect pixel information that has been affected by a previously rendered primitive, suspending reading of primitive information unless said affected pixel information has been updated.
30. The method of Claim 29, wherein a table is used to track said pixels with said unique identifier.
31. The method of Claim 29, wherein reads are not suspended if said primitive to be rendered appears in a history list of recently rendered primitive data.
32. The method of Claim 29, wherein a table is used to track said pixels with said unique identifier, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered.

33. A pipelined graphics system, comprising:

display hardware; and

video rendering hardware comprising, a read unit to read
information regarding a primitive to be rendered to be
5 displayed by said display hardware, a write unit to update
modified information regarding primitives, and a read monitor
unit to prevent primitive information which has been modified
from being read by said read unit before said write unit has
updated said information;

10 wherein said read monitor unit tracks pixel information affected by
previously rendered primitives and suspends reads if a
primitive to be rendered will affect pixel information which
has been affected by a previously rendered primitive until said
pixel information has had time to update.

34. The system of Claim 33, wherein said read monitor unit
implements a table to track said pixel information.

35. The system of Claim 33, wherein said read monitor unit
implements a table to track said pixel information, said table
comprising a first bit and a second bit and wherein said first bit
flags all pixels whose information has not yet been updated or
discarded and said second bit flags pixels which will be affected
by said primitive to be rendered.

36. The system of Claim 33, wherein said read monitor does not suspend reads if said primitive to be rendered appears in a history list of recently rendered primitive data.

37. A graphics processing subsystem, comprising:

5 at least four functionally distinct processing units, each including hardware elements which are customized to perform a rendering operation which is not performed by at least some others of said processing units; at least some ones of said processing units being connected to operate asynchronously to one another; and

10 a frame buffer, connected to be accessed by at least one of said processing units;

10 said processing units being mutually interconnected in a pipeline relationship, such that said processing units jointly provide a pipelined multiple-instruction-multiple-device (MIMD) graphics processing architecture;

15 wherein suspension of reads of pixel information during rendering of primitives is invoked only selectively.

38. (AMENDED) The subsystem of Claim 37, wherein a table is used to determine if reads should be suspended.

39. (AMENDED) The subsystem of Claim 37, wherein a table is used to determine if reads should be suspended, said table comprising a first bit and a second bit and wherein said first bit flags all pixels whose information has not yet been updated or discarded and said second bit flags pixels which will be affected by said primitive to be rendered.
40. (AMENDED) The subsystem of Claim 37, wherein suspension of reads is invoked unless said primitive to be rendered appears in a history list of recently rendered primitive data.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: :
 Baldwin *et al.* : Art Unit: 2671
 Serial No. 09/280,250 : Examiner: Mano Padmanabhan
 Filed: 03/29/1999 : Atty's Docket: TD-147
 For: Read Monitor Unit

APPENDIX B -

Proposed Amendment filed with Appeal Brief

This Amendment is submitted, concurrently with the Appeal Brief, as the subject of a possible Board remand or recommendation under MPEP §1211.01 or §1213.01, and/or for the Examiner's consideration as a way to remove issues from this appeal.

IN THE CLAIMS

1. (AMENDED) A method for rendering 3D graphics, comprising the steps of:
 - rendering primitives which comprise a graphics display;
 - invoking suspension of reads of pixel information during rendering of primitives only selectively, even if some outstanding writes have not been completed; and
 - writing data generated by said rendering step into a frame buffer, and outputting data from said frame buffer at video rates.

7. (AMENDED) A method for rendering 3D graphics, comprising the steps of:

providing data to be rendered to a rendering system which includes at least four functionally distinct processing units connected in a pipeline relationship;

allocating individual rendering operations to respective ones of said processing units, and performing said rendering operations;

invoking suspension of reads of pixel information during rendering of primitives only selectively, even if some outstanding writes have not been completed; and

writing data generated by said processing units into a frame buffer, and outputting data from said frame buffer at video rates.

37. (AMENDED) A graphics processing subsystem, comprising:

at least four functionally distinct processing units, each including hardware elements which are customized to perform a rendering operation which is not performed by at least some others of said processing units; at least some ones of said processing units being connected to operate asynchronously to one another; and

a frame buffer, connected to be accessed by at least one of said processing units;

said processing units being mutually interconnected in a pipeline relationship, such that said processing units jointly provide a pipelined multiple-instruction-multiple-device (MIMD) graphics processing architecture;

wherein suspension of reads of pixel information during rendering of primitives is invoked only selectively, even if some outstanding writes have not been completed.

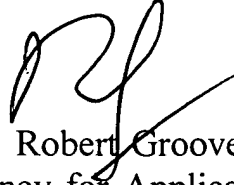
REMARKS

This proposed Amendment is submitted as a response to the remarks in the Final Action of 05/21/2002, and hence could not have been submitted earlier. This proposed Amendment is intended to make certain that the words "only selectively" in independent Claims 1, 7, and 37 will be interpreted in accordance with the application as filed.

The proposed Amendment is supported by the Text in the application as filed: "Currently, the solution to this second read problem is to force all outstanding writes to complete before any reads for the new primitive begin. ... In the disclosed embodiments, reading of pixel information during the rendering of a primitive is suspend[ed] if the pixel information has been touched by a previous write." (Page 4 ll.24—26, Page 6 ll.3-6.)

The foregoing correction is believed not to introduce new matter, and its entry is respectfully requested if the Examiner or the Board believes that this would remove issues from this appeal.

Respectfully submitted,



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April 21, 2003

reached on the basis of the facts gleaned from the prior art.

ESTABLISHING A *PRIMA FACIE* CASE OF OBVIOUSNESS

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 - § 2143.03 for decisions pertinent to each of these criteria.

The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). See MPEP § 2144 - § 2144.09 for examples of reasoning supporting obviousness rejections.

When the motivation to combine the teachings of the references is not immediately apparent, it is the duty of the examiner to explain why the combination of the teachings is proper. *Ex parte Skinner*, 2 USPQ2d 1788 (Bd. Pat. App. & Inter. 1986). A statement of a rejection that includes a large number of rejections must explain with reasonable specificity at least one rejection, otherwise the examiner procedurally fails to establish a *prima facie* case of obviousness. *Ex parte Blanc*, 13 USPQ2d 1383 (Bd. Pat. App. & Inter. 1989) (Rejection based on nine references which included at least 40 prior art rejections without explaining any one rejection with reasonable

specificity was reversed as procedurally failing to establish a *prima facie* case of obviousness.).

If the examiner determines there is factual support for rejecting the claimed invention under 35 U.S.C. 103, the examiner must then consider any evidence supporting the patentability of the claimed invention, such as any evidence in the specification or any other evidence submitted by the applicant. The ultimate determination of patentability is based on the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence. *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). The legal standard of "a preponderance of evidence" requires the evidence to be more convincing than the evidence which is offered in opposition to it. With regard to rejections under 35 U.S.C. 103, the examiner must provide evidence which as a whole shows that the legal determination sought to be proved (i.e., the reference teachings establish a *prima facie* case of obviousness) is more probable than not.

When an applicant submits evidence, whether in the specification as originally filed or in reply to a rejection, the examiner must reconsider the patentability of the claimed invention. The decision on patentability must be made based upon consideration of all the evidence, including the evidence submitted by the examiner and the evidence submitted by the applicant. A decision to make or maintain a rejection in the face of all the evidence must show that it was based on the totality of the evidence. Facts established by rebuttal evidence must be evaluated along with the facts on which the conclusion of obviousness was reached, not against the conclusion itself. *In re Eli Lilly & Co.*, 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990).

See *In re Piasecki*, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984) for a discussion of the proper roles of the examiner's *prima facie* case and applicant's rebuttal evidence in the final determination of obviousness. See MPEP § 706.02(j) for a discussion of the proper contents of a rejection under 35 U.S.C. 103.

2143 Basic Requirements of a *Prima Facie* Case of Obviousness

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the refer-

ences themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

2143.01 Suggestion or Motivation To Modify the References [R-1]

THE PRIOR ART MUST SUGGEST THE DESIRABILITY OF THE CLAIMED INVENTION

"There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper.). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999).

"In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be

solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also *In re Lee*, 277 F.3d 1338, 1342-44, 61 USPQ2d 1430, 1433-34 (Fed. Cir. 2002) (discussing the importance of relying on objective evidence and making specific factual findings with respect to the motivation to combine references); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

In *In re Kotzab*, the claims were drawn to an injection molding method using a single temperature sensor to control a plurality of flow control valves. The primary reference disclosed a multizone device having multiple sensors, each of which controlled an associated flow control valve, and also taught that one system may be used to control a number of valves. The court found that there was insufficient evidence to show that one system was the same as one sensor. While the control of multiple valves by a single sensor rather than by multiple sensors was a "technologically simple concept," there was no finding "as to the specific understanding or principle within the knowledge of the skilled artisan" that would have provided the motivation to use a single sensor as the system to control more than one valve. 217 F.3d at 1371, 55 USPQ2d at 1318.

In *In re Fine*, the claims were directed to a system for detecting and measuring minute quantities on nitrogen compounds comprising a gas chromatograph, a converter which converts nitrogen compounds into nitric oxide by combustion, and a nitric oxide detector. The primary reference disclosed a system for monitoring sulfur compounds comprising a chromatograph, combustion means, and a detector, and the secondary reference taught nitric oxide detectors. The examiner and Board asserted that it would have been within the skill of the art to substitute one type of detector for another in the system of the primary reference, however the court found there was no support or explanation of this conclusion and reversed.

In *In re Jones*, the claimed invention was the 2-(2-aminoethoxy) ethanol salt of dicamba, a compound with herbicidal activity. The primary reference disclosed *inter alia* the substituted ammonium salts of dicamba as herbicides, however the reference did not specifically teach the claimed salt. Secondary refer-

ences teaching the amine portion of the salt were directed to shampoo additives and a byproduct of the production of morpholine. The court found there was no suggestion to combine these references to arrive at the claimed invention.

WHERE THE TEACHINGS OF THE PRIOR ART CONFLICT, THE EXAMINER MUST WEIGH THE SUGGESTIVE POWER OF EACH REFERENCE

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art, and all teachings in the prior art must be considered to the extent that they are in analogous arts. Where the teachings of two or more prior art references conflict, the examiner must weigh the power of each reference to suggest solutions to one of ordinary skill in the art, considering the degree to which one reference might accurately discredit another. *In re Young*, 927 F.2d 588, 18 USPQ2d 1089 (Fed. Cir. 1991) (Prior art patent to Carlisle disclosed controlling and minimizing bubble oscillation for chemical explosives used in marine seismic exploration by spacing seismic sources close enough to allow the bubbles to intersect before reaching their maximum radius so the secondary pressure pulse was reduced. An article published several years later by Knudsen opined that the Carlisle technique does not yield appreciable improvement in bubble oscillation suppression. However, the article did not test the Carlisle technique under comparable conditions because Knudsen did not use Carlisle's spacing or seismic source. Furthermore, where the Knudsen model most closely approximated the patent technique there was a 30% reduction of the secondary pressure pulse. On these facts, the court found that the Knudsen article would not have deterred one of ordinary skill in the art from using the Carlisle patent teachings.).

FACT THAT REFERENCES CAN BE COMBINED OR MODIFIED IS NOT SUFFICIENT TO ESTABLISH *PRIMA FACIE* OBVIOUSNESS

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680,

16 USPQ2d 1430 (Fed. Cir. 1990) (Claims were directed to an apparatus for producing an aerated cementitious composition by drawing air into the cementitious composition by driving the output pump at a capacity greater than the feed rate. The prior art reference taught that the feed means can be run at a variable speed, however the court found that this does not require that the output pump be run at the claimed speed so that air is drawn into the mixing chamber and is entrained in the ingredients during operation. Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." 916 F.2d at 682, 16 USPQ2d at 1432.). See also *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992) (flexible landscape edging device which is conformable to a ground surface of varying slope not suggested by combination of prior art references).

FACT THAT THE CLAIMED INVENTION IS WITHIN THE CAPABILITIES OF ONE OF ORDINARY SKILL IN THE ART IS NOT SUFFICIENT BY ITSELF TO ESTABLISH *PRIMA FACIE* OBVIOUSNESS

A statement that modifications of the prior art to meet the claimed invention would have been " 'well within the ordinary skill of the art' at the time the claimed invention was made' " because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See also *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) (Court reversed obviousness rejection involving technologically simple concept because there was no finding as to the principle or specific understanding within the knowledge of a skilled artisan that would have motivated the skilled artisan to make the claimed invention); *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999) (The level of skill in the art cannot be relied upon to provide the suggestion to combine references.).

THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) (Claimed device was a blood filter assembly for use during medical procedures wherein both the inlet and outlet for the blood were located at the bottom end of the filter assembly, and wherein a gas vent was present at the top of the filter assembly. The prior art reference taught a liquid strainer for removing dirt and water from gasoline and other light oils wherein the inlet and outlet were at the top of the device, and wherein a pet-cock (stopcock) was located at the bottom of the device for periodically removing the collected dirt and water. The reference further taught that the separation is assisted by gravity. The Board concluded the claims were *prima facie* obvious, reasoning that it would have been obvious to turn the reference device upside down. The court reversed, finding that if the prior art device was turned upside down it would be inoperable for its intended purpose because the gasoline to be filtered would be trapped at the top, the water and heavier oils sought to be separated would flow out of the outlet instead of the purified gasoline, and the screen would become clogged.).

“Although statements limiting the function or capability of a prior art device require fair consideration, simplicity of the prior art is rarely a characteristic that weighs against obviousness of a more complicated device with added function.” *In re Dance*, 160 F.3d 1339, 1344, 48 USPQ2d 1635, 1638 (Fed. Cir. 1998) (Court held that claimed catheter for removing obstruction in blood vessels would have been obvious in view of a first reference which taught all of the claimed elements except for a “means for recovering fluid and debris” in combination with a second reference describing a catheter including that means. The court agreed that the first reference, which stressed simplicity of structure and taught emulsification of the debris, did not teach away from the addition of a channel for the recovery of the debris.).

THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) (Claims were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced by a cylindrical sheet metal casing. Patentee taught the device required rigidity for operation, whereas the claimed invention required resiliency. The court reversed the rejection holding the “suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate.” 270 F.2d at 813, 123 USPQ at 352.).

2143.02 Reasonable Expectation of Success Is Required**OBVIOUSNESS REQUIRES ONLY A REASONABLE EXPECTATION OF SUCCESS**

The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (Claims directed to a method of treating depression with amitriptyline (or nontoxic salts thereof) were rejected as *prima facie* obvious over prior art disclosures that amitriptyline is a compound known to possess psychotropic properties and that imipramine is a structurally similar psychotropic compound known to possess antidepressive properties, in view of prior art suggesting the aforementioned compounds would be expected to have similar activity because the structural difference between the compounds involves a known bioisosteric replacement and because a research paper comparing the pharmacological properties of these two compounds suggested clinical testing of amitriptyline as an antidepressant. The court

sustained the rejection, finding that the teachings of the prior art provide a sufficient basis for a reasonable expectation of success.); *Ex parte Blanc*, 13 USPQ2d 1383 (Bd. Pat. App. & Inter. 1989) (Claims were directed to a process of sterilizing a polyolefinic composition with high-energy radiation in the presence of a phenolic polyester antioxidant to inhibit discoloration or degradation of the polyolefin. Appellant argued that it is unpredictable whether a particular antioxidant will solve the problem of discoloration or degradation. However, the Board found that because the prior art taught that appellant's preferred antioxidant is very efficient and provides better results compared with other prior art antioxidants, there would have been a reasonable expectation of success.).

AT LEAST SOME DEGREE OF PREDICTABILITY IS REQUIRED; APPLICANTS MAY PRESENT EVIDENCE SHOWING THERE WAS NO REASONABLE EXPECTATION OF SUCCESS

Obviousness does not require absolute predictability, however, at least some degree of predictability is required. Evidence showing there was no reasonable expectation of success may support a conclusion of nonobviousness. *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976) (Claims directed to a method for the commercial scale production of polyesters in the presence of a solvent at superatmospheric pressure were rejected as obvious over a reference which taught the claimed method at atmospheric pressure in view of a reference which taught the claimed process except for the presence of a solvent. The court reversed, finding there was no reasonable expectation that a process combining the prior art steps could be successfully scaled up in view of unchallenged evidence showing that the prior art processes individually could not be commercially scaled up successfully.). See also *Amgen, Inc. v. Chugai Pharmaceutical Co.*, 927 F.2d 1200, 1207-08, 18 USPQ2d 1016, 1022-23 (Fed. Cir.), *cert. denied*, 502 U.S. 856 (1991) (In the context of a biotechnology case, testimony supported the conclusion that the references did not show that there was a reasonable expectation of success.); *In re O'Farrell*, 853 F.2d 894, 903, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988) (The court held the claimed method would have been obvious

over the prior art relied upon because one reference contained a detailed enabling methodology, a suggestion to modify the prior art to produce the claimed invention, and evidence suggesting the modification would be successful.).

PREDICTABILITY IS DETERMINED AT THE TIME THE INVENTION WAS MADE

Whether an art is predictable or whether the proposed modification or combination of the prior art has a reasonable expectation of success is determined at the time the invention was made. *Ex parte Erlich*, 3 USPQ2d 1011 (Bd. Pat. App. & Inter. 1986) (Although an earlier case reversed a rejection because of unpredictability in the field of monoclonal antibodies, the court found "in this case at the time this invention was made, one of ordinary skill in the art would have been motivated to produce monoclonal antibodies specific for human fibroblast interferon using the method of [the prior art] with a reasonable expectation of success." 3 USPQ2d at 1016 (emphasis in original).).

2143.03 All Claim Limitations Must Be Taught or Suggested

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

INDEFINITE LIMITATIONS MUST BE CONSIDERED

A claim limitation which is considered indefinite cannot be disregarded. If a claim is subject to more than one interpretation, at least one of which would render the claim unpatentable over the prior art, the examiner should reject the claim as indefinite under 35 U.S.C. 112, second paragraph (see MPEP § 706.03(d)) and should reject the claim over the prior art based on the interpretation of the claim that ren-

ders the prior art applicable. *Ex parte Ionescu*, 222 USPQ 537 (Bd. Pat. App. & Inter. 1984) (Claims on appeal were rejected on indefiniteness grounds only; the rejection was reversed and the case remanded to the examiner for consideration of pertinent prior art.). Compare *In re Wilson*, 424 F.2d 1382, 165 USPQ 494 (CCPA 1970) (if no reasonably definite meaning can be ascribed to certain claim language, the claim is indefinite, not obvious) and *In re Steele*, 305 F.2d 859, 134 USPQ 292 (CCPA 1962) (it is improper to rely on speculative assumptions regarding the meaning of a claim and then base a rejection under 35 U.S.C. 103 on these assumptions).

LIMITATIONS WHICH DO NOT FIND SUPPORT IN THE ORIGINAL SPECIFICATION MUST BE CONSIDERED

When evaluating claims for obviousness under 35 U.S.C. 103, all the limitations of the claims must be considered and given weight, including limitations which do not find support in the specification as originally filed (i.e., new matter). *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983) *aff'd mem.* 738 F.2d 453 (Fed. Cir. 1984) (Claim to a catalyst expressly excluded the presence of sulfur, halogen, uranium, and a combination of vanadium and phosphorous. Although the negative limitations excluding these elements did not appear in the specification as filed, it was error to disregard these limitations when determining whether the claimed invention would have been obvious in view of the prior art.).

2144 Sources of Rationale Supporting a Rejection Under 35 U.S.C. 103

RATIONALE MAY BE IN A REFERENCE, OR REASONED FROM COMMON KNOWLEDGE IN THE ART, SCIENTIFIC PRINCIPLES, ART-RECOGNIZED EQUIVALENTS, OR LEGAL PRECEDENT

The rationale to modify or combine the prior art does not have to be expressly stated in the prior art; the rationale may be expressly or impliedly contained in the prior art or it may be reasoned from knowledge generally available to one of ordinary skill in the art, established scientific principles, or legal precedent established by prior case law. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*,

958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). See also *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) (setting forth the standard for implicit teachings); *In re Eli Lilly & Co.*, 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990) (discussion of reliance on legal precedent); *In re Nilssen*, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988) (references do not have to explicitly suggest combining teachings); *Ex parte Clapp*, 227 USPQ 972 (Bd. Pat. App. & Inter. 1985) (examiner must present convincing line of reasoning supporting rejection); and *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993) (reliance on logic and sound scientific reasoning).

THE EXPECTATION OF SOME ADVANTAGE IS THE STRONGEST RATIONALE FOR COMBINING REFERENCES

The strongest rationale for combining references is a recognition, expressly or impliedly in the prior art or drawn from a convincing line of reasoning based on established scientific principles or legal precedent, that some advantage or expected beneficial result would have been produced by their combination. *In re Sernaker*, 702 F.2d 989, 994-95, 217 USPQ 1, 5-6 (Fed. Cir. 1983).

LEGAL PRECEDENT CAN PROVIDE THE RATIONALE SUPPORTING OBVIOUSNESS ONLY IF THE FACTS IN THE CASE ARE SUFFICIENTLY SIMILAR TO THOSE IN THE APPLICATION

The examiner must apply the law consistently to each application after considering all the relevant facts. If the facts in a prior legal decision are sufficiently similar to those in an application under examination, the examiner may use the rationale used by the court. If the applicant has demonstrated the criticality of a specific limitation, it would not be appropriate to rely solely on case law as the rationale to support an obviousness rejection. "The value of the exceedingly large body of precedent wherein our predecessor courts and this court have applied the law of obviousness to particular facts, is that there has been built a wide spectrum of illustrations and accompanying reasoning, that have been melded into a fairly consistent application of law to a great variety of facts." *In re Eli*



1/4

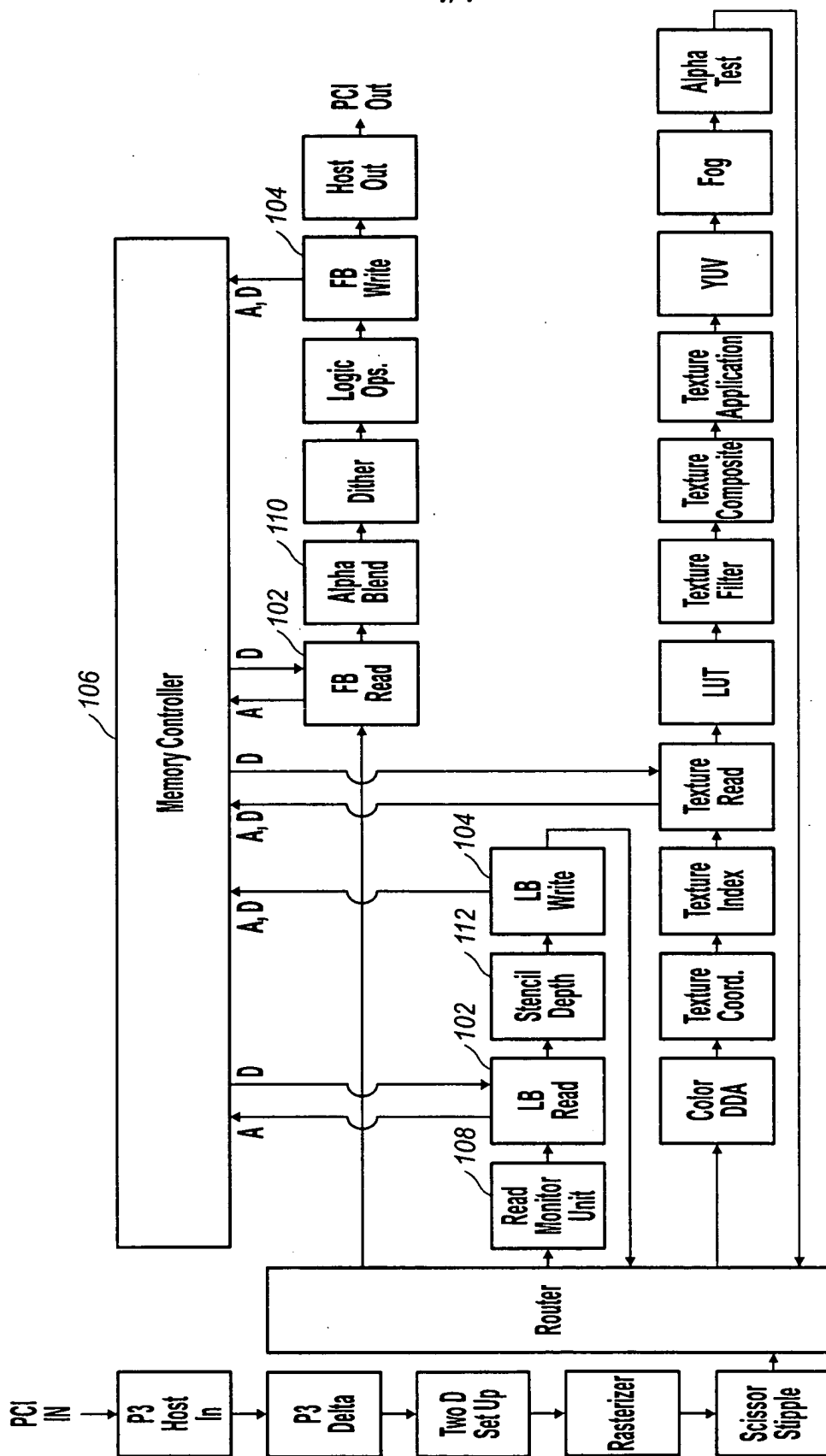


FIG. 1



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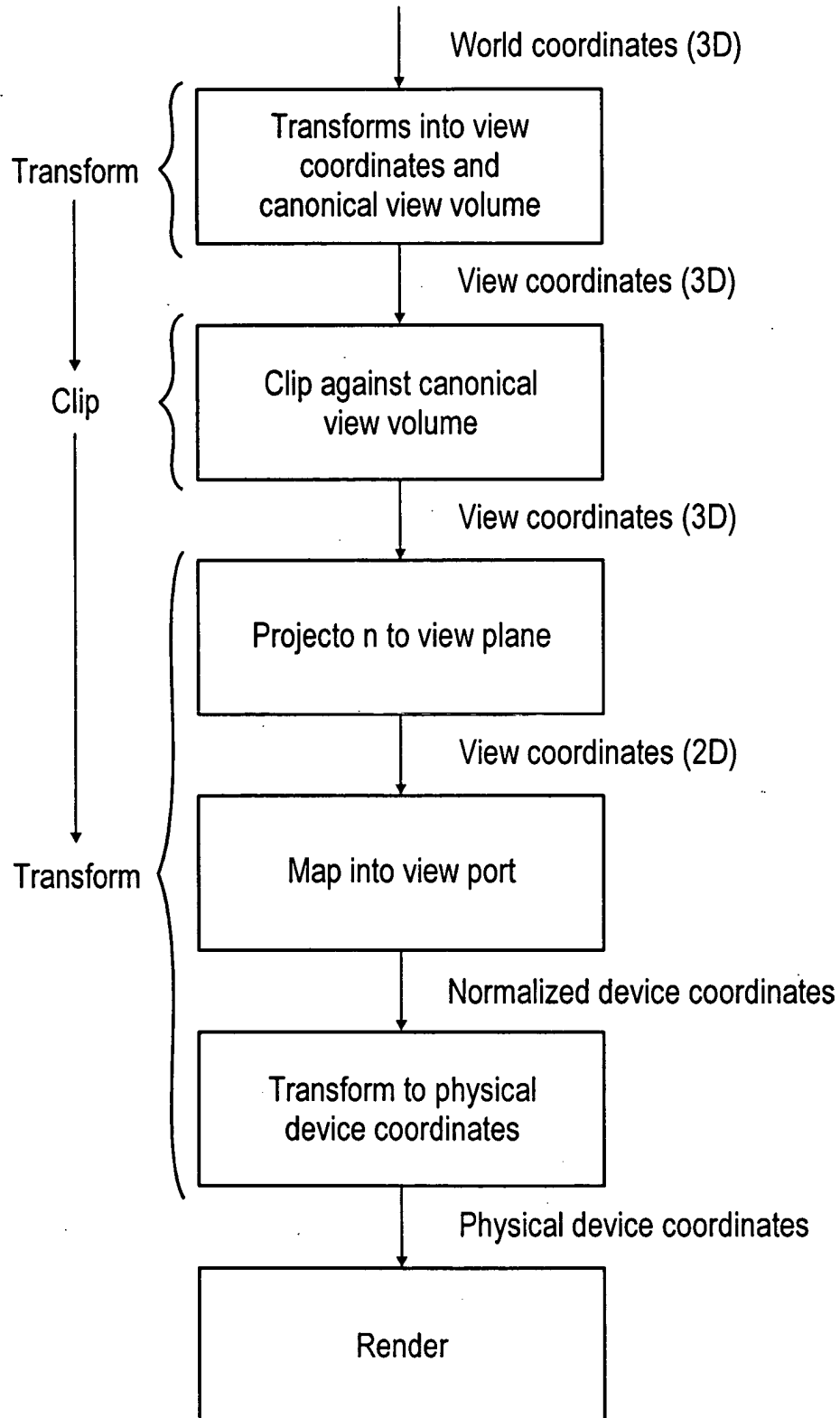


FIG. 2



3/4

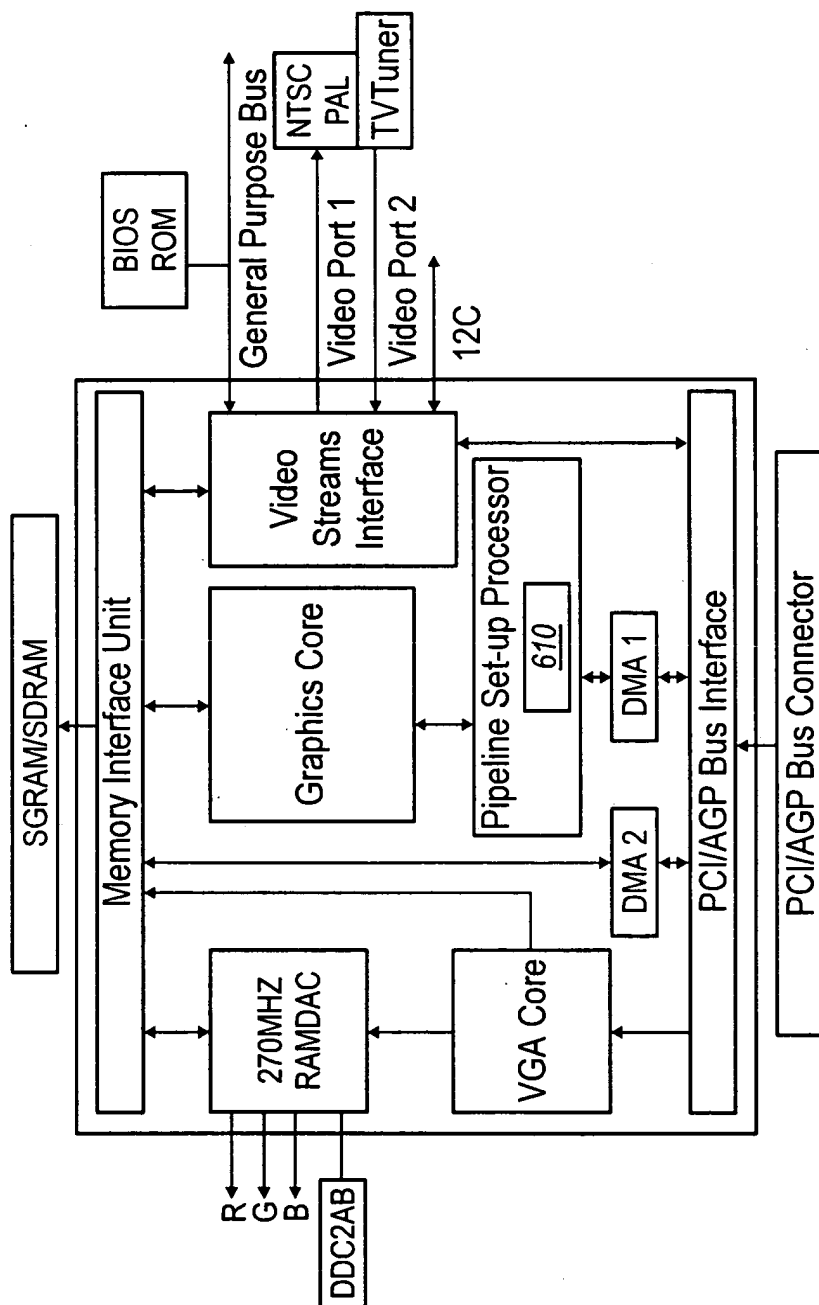
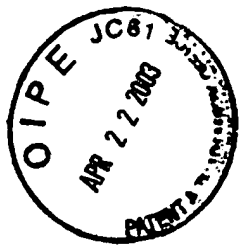


FIG. 3



4/4

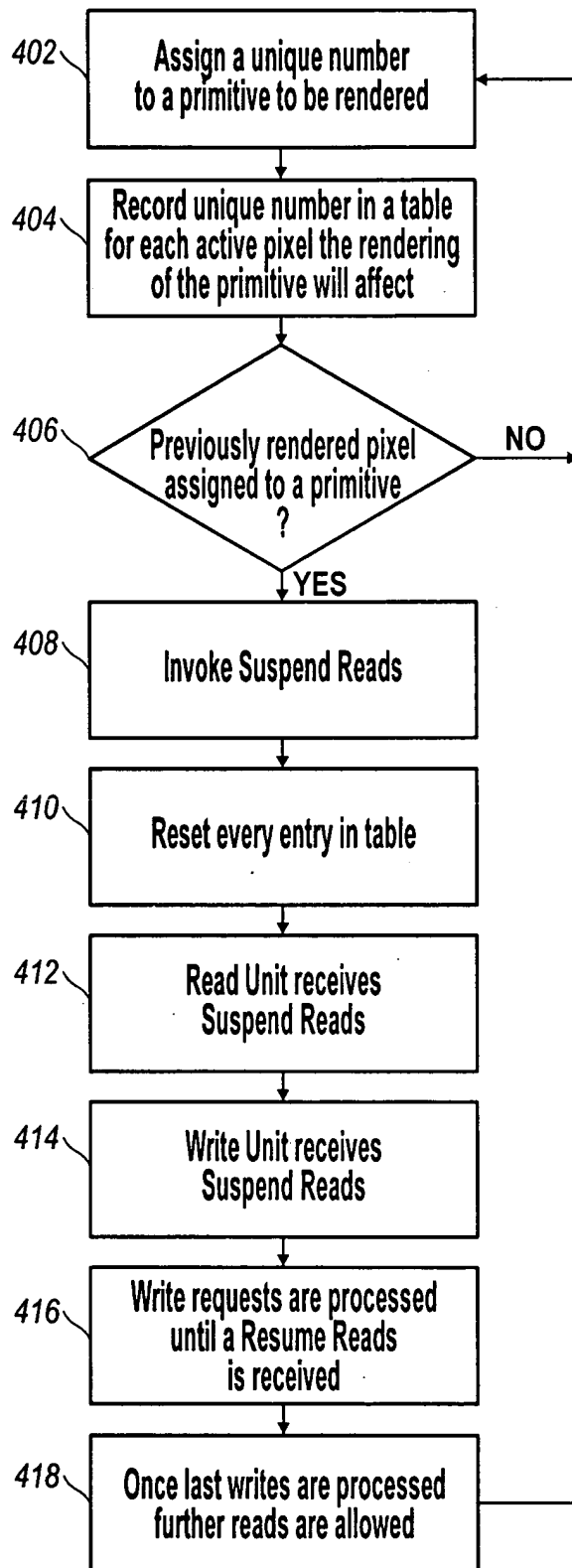


FIG. 4

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**NOTICE OF APPEAL FROM THE EXAMINER TO THE
BOARD OF PATENT APPEALS AND INTERFERENCES**

Docket Number (Optional)

TD-147

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Assistant Commissioner for Patents, Washington D.C. 20231" on 11/21/02

Signature

Typed or printed

name Robert O. Groover III

In re Application of

David Robert Baldwin et al.

Application Number
09/280,250Filed
03/29/1999

For

Read Monitor Unit

Group Art Unit

2671

Examiner

Padmanabhan, Mano

Applicant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the examiner.

The fee for this Notice of Appeal is (37 CFR 1.17(b))

\$ 320.00

☐ Applicant claims small entity status. See 37 CFR 1.27. Therefore, the fee shown above is reduced by half, and the resulting fee is:

\$ _____

☒ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Commissioner has already been authorized to charge fees in this application to a Deposit Account. I have enclosed a duplicate copy of this sheet.

☐ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. _____. I have enclosed a duplicate copy of this sheet.

☒ A petition for an extension of time under 37 CFR 1.136(a) (PTO/SB/22) is enclosed.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

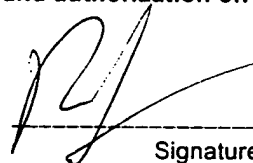
☐ applicant/inventor.

☐ assignee of record of the entire interest.
See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

☒ attorney or agent of record.

☐ attorney or agent acting under 37 CFR 1.34(a).

Registration number if acting under 37 CFR 1.34(a) _____



Signature

Robert O. Groover III

Typed or printed name

11/21/2002

Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ Total of 1 forms are submitted.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.